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IMAGERY
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PHOTOGRAPHIC INTELLIGENCE REPORT

BAC GIANG CHEMICAL FERTILIZER PLANT
BAC GIANG, NORTH VIETNAM

CIA/PIR 75081

DATE JAN. 1967

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WARNING

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Approved For Release 2003/03/28 : CIA-RDP78T05161A001300010004-1

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FIGURE 1

NORTH VIETNAM

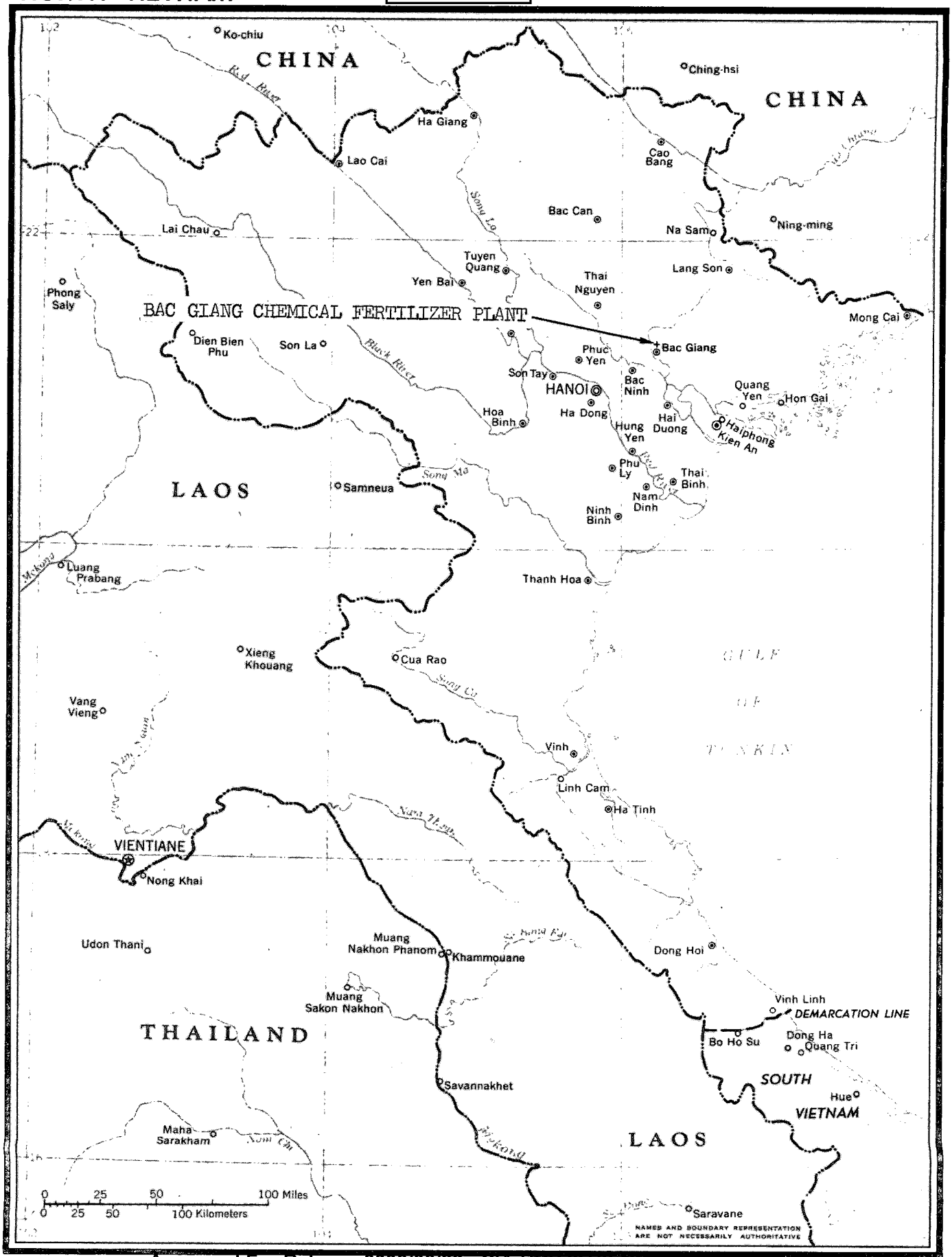

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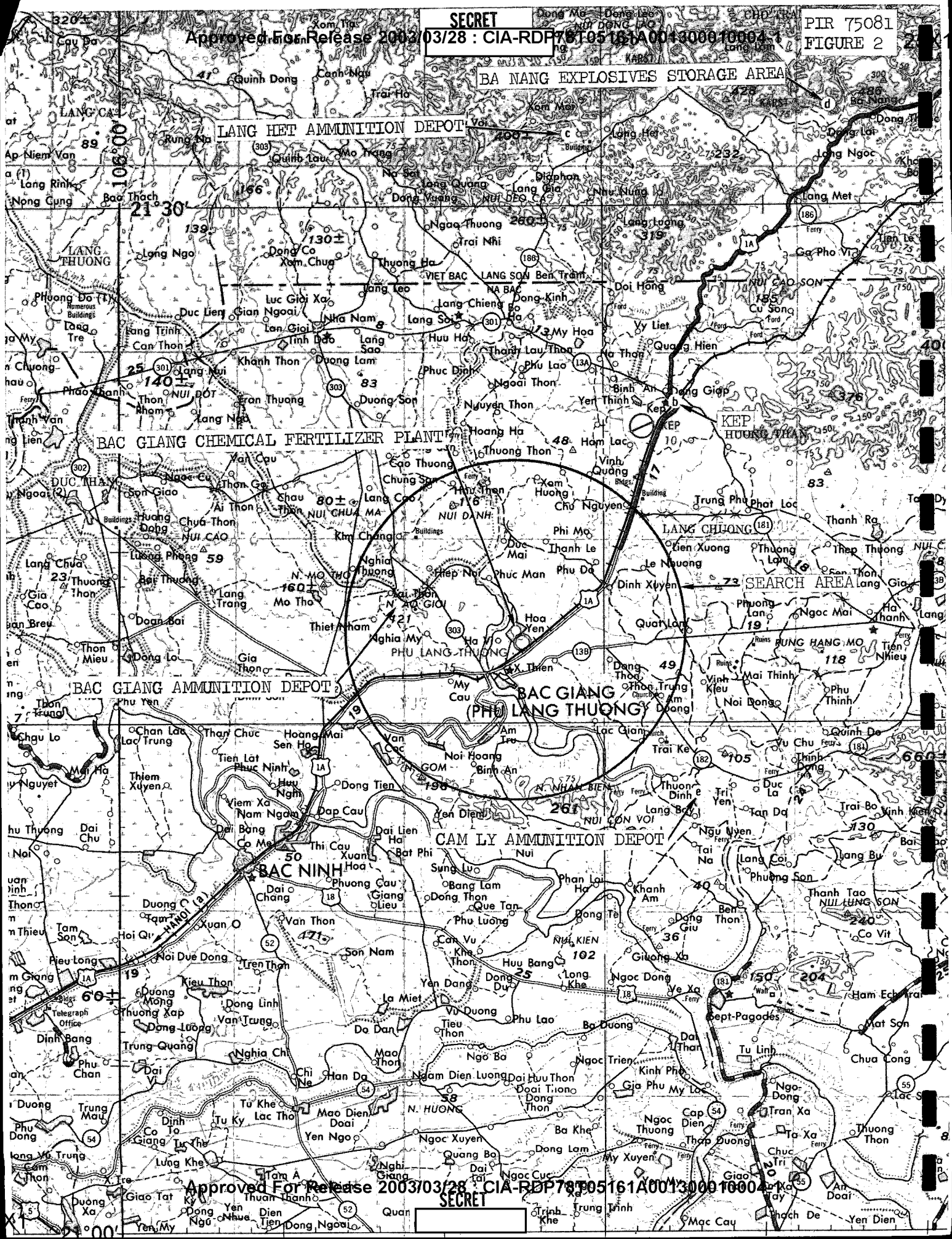
FIGURE 2



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BAC GIANG (HA BAC) CHEMICAL FERTILIZER PLANT

The Bac Giang Chemical Fertilizer Plant is located approximately 1.7 nautical miles north-northeast of the center of Bac Giang (Phu Lang Thuong) complex at the geographic coordinates 21 17N - 106 12E (Figures 1 and 2). The plant is of modern design and similar in plan to the newer Chinese nitrogen fertilizer plants. The installation is road, rail and river served.

In conducting this study, not only the facilities at the plant were examined, but also a search was made in the surrounding area to a radius of at least five nautical miles to determine whether or not this plant, when it becomes operational, could provide nearby facilities with components for the production of military explosives. The data presented in this report were obtained from both high and low level, over-flight photography covering the time period from [redacted] 25X1

The following is a discussion of the various production areas within the installation. However, it should again be emphasized here that the indicators of production activity on the latest available photography show the plant to be inoperative. Products from this plant will include synthetic ammonia, dilute nitric acid, ammonium nitrate, and probably other ammonium and nitrogen based compounds for agricultural and industrial use. The various plant components and facilities are shown on the annotated Figure 10.

Hydrogen for the synthesis of ammonia will be obtained from retorted coal gas which is a mixture of hydrogen, methane, carbon dioxide and carbon monoxide. The hydrogen content of the gas is enriched by first reforming the methane and then by reacting carbon monoxide and steam in the contact ovens. The resultant gas is then passed through purification and scrubbing units and a relatively pure hydrogen is obtained. Nitrogen used in ammonia production will probably be obtained from an air liquefaction process.

The ammonia production area contains a large compressor/synthesis building for the direct compounding of hydrogen and nitrogen to form ammonia. Although no tankage for storing liquids was noted in this area, at least some of the ammonia produced will probably be shipped from the plant as aqueous ammonia. However, the bulk of the synthetic ammonia will probably be used within the plant to produce nitric acid and chemical fertilizer.

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The nitric acid plant is relatively small, and contains only one, high-pressure absorber. The acid will be produced by the usual method of absorbing in water the gas formed by the oxidization of ammonia. Most of the acid produced here will probably be used within the installation for ammonium nitrate production.

The ammonium nitrate fertilizer production facilities appear to be quite modern in design and large enought to produce a significant quantity of prilled fertilizer. The ammonium nitrate produced in this section could be used in an explosive compound; however, the quality and grain size produced by prilling would not be of the uniformity desired in the production of explosives. The preferred method of producing explosive quality ammonium nitrate is by graining.

A relatively large production area (Figure 10, Area H) contains a line of processing buildings which structurally and location-wise might be suitable for finishing ammonium nitrate by the graining method. Graining is accomplished by evaporating a solution of ammonia and nitric acid in steam heated vats to almost dryness and then cooling at a controlled rate while stirring the solidifying mass with heavy plows. The resulting product when the batch eventually hardens is small, uniformly sized, rounded grains of ammonium nitrate. This product could then be mixed with other components, such as TNT, or with fuel oil and packaged in water-proof containers for explosive uses. Two fabrication/engineering-type buildings in this area could feasibly house the type of equipment needed to produce canisters and/or suitable packaging for ammonium nitrate explosives. However, the close spacing of the buildings and the lack of revetting and blast walls would suggest that the mixing of ammonium nitrate with other compounds, except possibly fuel oil, to form the more sophisticated explosives has not been planned for this plant. Also, the processing buildings could be intended to manufacture chemicals solely for agricultural and industrial uses. It is questionable whether or not the purpose of this production area can in the future be determined solely from photography, but when the plant becomes operational the type of materials and transportation associated with these buildings should give some indications of the products.

The small, secured, isolated area (Figure 10, Area N) which contains three semi-buried storage tanks, two small buildings and a small open pond could be intended for the storage and mixing of fuel oil and/or other components with the ammonium nitrate. However, this area could merely be a waste treatment and disposal facility. When the plant becomes operational, the purpose of this facility can possibly be determined.

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Search of the area surrounding the Bac Giang Chemical Fertilizer Plant (Figure 2) on good quality photography dated [redacted] revealed no recognizable explosive manufacturing or loading facilities. The only revetted storage noted in the area was the Bac Giang Ammunition Depot [redacted] located approximately 3.8 nautical miles west of the fertilizer plant at geographic coordinates 21 18N - 106 08E (Figure 2). As the name implies, this facility more closely resembles an ammunition storage area than it does an explosives storage area. The facility contains 8 large revetted, 1 small revetted and 1 large unrevetted storage-type buildings, and at least 3 small support buildings dispersed along a road around the foot of a small hill. There is no direct connection between this facility and the fertilizer plant.

In the event that the Bac Giang plant produces explosives or explosive components when it becomes operational, there are several possible handling facilities outside of the search area but within easy transport distance of the plant. The following is a general listing of such facilities (Figure 2):

(a) Installations at Hanoi - approximately 25 nm SW
(b) Installations in the Kep Area - approximately 9 nm NNE
(c) Lang Het Ammunition Depot [redacted] - approximately 14.5 nm NNE - bombed and partially destroyed
(d) Ba Nang Explosives Storage Area - approximately 17.8 nm NE
(e) Cam Ly Ammunition Depot - approximately 7.3 nm SE

However, due to the limitations of photography, it will very likely be impossible to establish any definite linkage between these facilities and the Bac Giang plant by photo interpretation alone.

The level of construction activity continued at a high level throughout the time period covered by this study. The following tabulation shows the general state of completion of the plant as illustrated by the chronological sequence of photo enlargement included in this report (Figures 3-10). Some of the major construction events and the nearby areas of civilian housing have been annotated on the appropriate photos. The more oblique photograph (Figure 9) was included to illustrate the type of structures within the plant area.

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Date	Estimated Stage of Construction	Comments
	Very Early	No major production or transportation facilities completed. Areas of construction cleared and many footings, foundations and some building walls in place.
	Early	Some support/storage buildings completed. Most major components started - none completed.
	Early/Mid	Processing area (Figure 10-H) and power plant buildings nearly completed.
	Mid/Late	All major components except acid absorber and possible air liquefaction facility appear to be completed or nearly complete. Access road to possible liquid storage area first observed. Rail cars noted in plant area. Steam and gas lines being laid throughout the area.
	Late	All major components except the fertilizer warehouse appear complete. Rail traffic noted in the coal processing area and smoke being emitted from the power plant. A possible, slight rise in the level of the raw gasholder could indicate that the retorts have been tested. Water treatment facility is in use. Lack of raw material (coal) and general appearance of the plant indicates production has not yet started.
	Very Late/Complete	Plant facilities all appear essentially complete, but lack of raw materials and general appearance indicates plant still inoperative.

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FIGURE 3

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BAC GIANG CHEMICAL FERTILIZER PLANT
NORTH VIETNAM
21 17N - 106 12E

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FIGURE 4

BAC GIANG CHEMICAL FERTILIZER PLANT
NORTH VIETNAM
21 17N - 106 12E

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FIGURE 5

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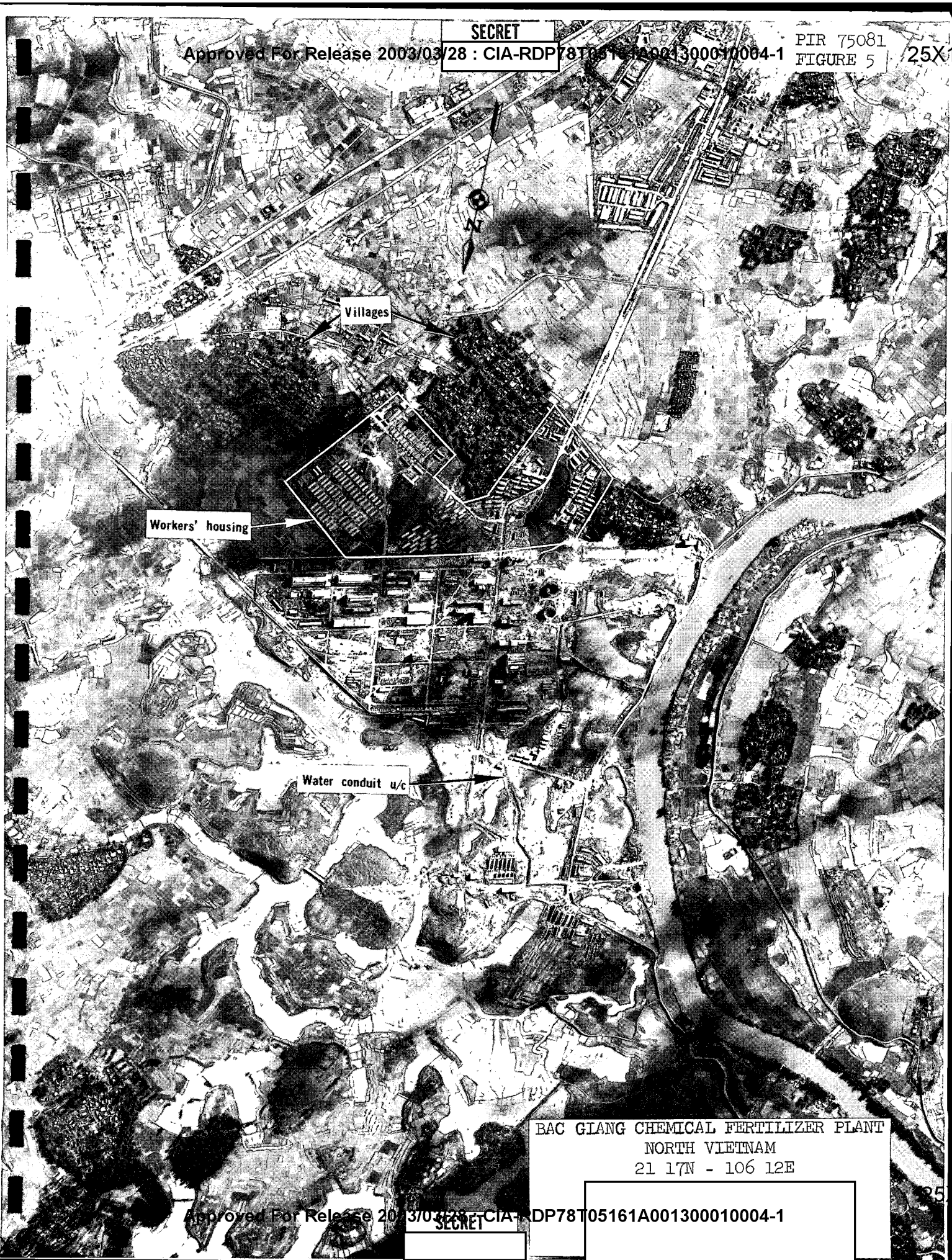

BAC GIANG CHEMICAL FERTILIZER PLANT
NORTH VIETNAM
21 17N - 106 12E

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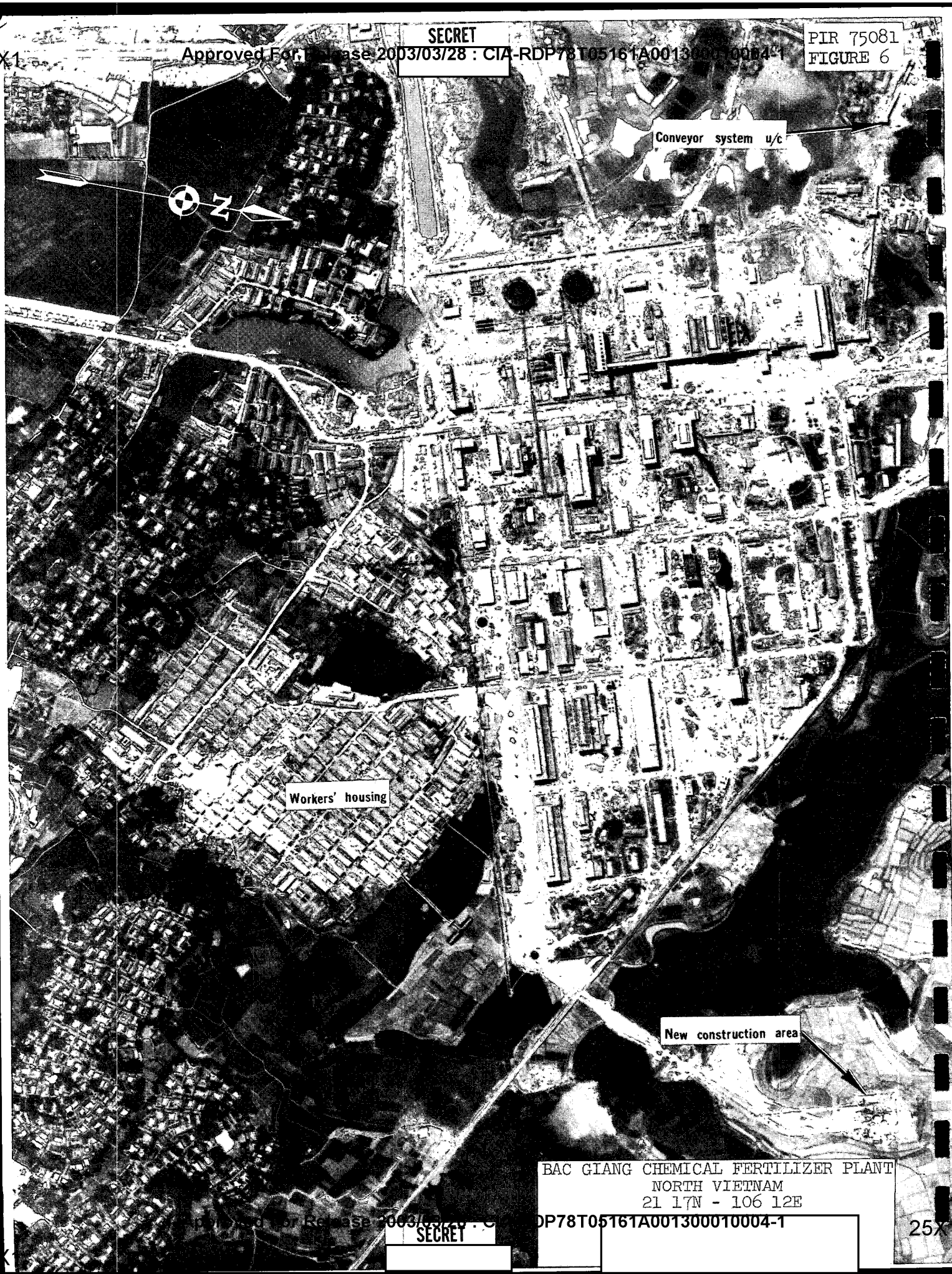
FIGURE 6



BAC GIANG CHEMICAL FERTILIZER PLANT
NORTH VIETNAM
21 17N - 106 12E

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BAC GIANG CHEMICAL FERTILIZER PLANT
NORTH VIETNAM
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FIGURE 8

BAC GIANG CHEMICAL FERTILIZER PLANT
NORTH VIETNAM
21 17N - 106 12E

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FIGURE 9

BAC GIANG CHEMICAL FERTILIZER PLANT
NORTH VIETNAM
21 17N - 106 12E

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KEY TO ANNOTATIONS

AREA A -- Power Plant and Coal Preparation Area
1. Coal preparation and storage building
2. Power/steam plant
3. Conveyor system
4. Liquie fuel storage tanks

AREA B -- Gas Production Area
5. Gas retorts
6. Reform unit
7. Raw gasholder
8. Contact ovens
9. Purification units
10. Hydrogen gasholder
11. Water treatment ponds
12. Possible cooling tower

AREA C -- Ammonia Production Area
13. Carbon monoxide scrubbers
14. Compressor/synthesis building
15. Converter tower

AREA D -- U/I Production Area
16. U/I processing building
17. U/I processing building

AREA E -- Possible Air Liquefaction Plant
18. Possible secondary products handling facility
19. Possible compressor/air liquefaction building
20. Possible nitrogen gasholder

AREA F -- Nitric Acid Plant
21. U/I processing building
22. Ammonia oxidization building
23. High-pressure absorber
24. Lattice tower (venting tower)
25. Acid storage tanks

AREA G -- Fertilizer Production Area
26. Ammonium nitrate reactor building
27. Prilling tower
28. Conveyor
29. Final processing, bagging and storage building

AREA H -- Production Area (Possibly for explosive grade ammonium nitrate and/or chemicals for agricultural and industrial uses).
30. Support/shop building
31. Processing building (possible mixing and evaporation building).
32. Support/storage/processing building
33. Storage building
34. Processing building
35. Processing (possible graining and loading building)
36. Storage building
37. U/I processing building
38. Engineering/fabrication type building
39. Engineering/fabrication type building

AREA I -- Expansion and Open Storage Area

AREA J -- Possible Expansion and Storage Area
40. Liquid storage tank

AREA K -- Administration Area

AREA L -- Coal Transshipment Area
41. Fixed crane (2)
42. Conveyor system

AREA M -- Water Treatment Plant
43. Water intake facility
44. Water conduits

AREA N -- Liquid Storage or Possible Waste Disposal Facility
45. Semi-buried storage tanks (3)
46. Pipeline and access road

AREA O -- Waste Disposal and/or Discharge Facility
47. Pumping station

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FIGURE 10

CHEMICAL FERTILIZER PLANT
BAC GIANG, NORTH VIETNAM
21 17N - 106 12E

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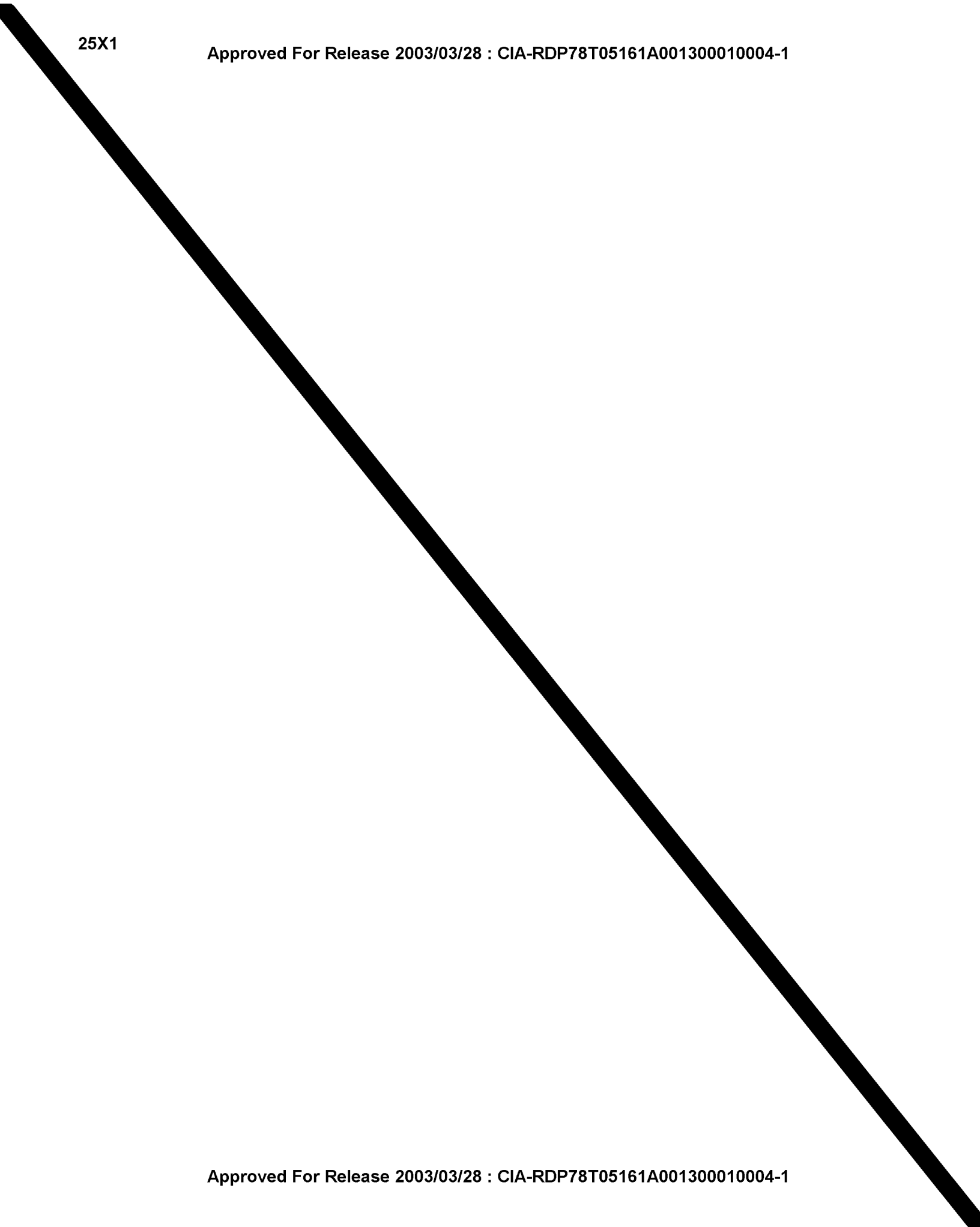

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MAPS AND CHARTS

Locator Map, North Vietnam - 51283 3-65, UNCLASSIFIED
JOG (G), Series 1501, Sheet NF 48-11, 1st Edition, May 1965,
Scale 1:25,000, UNCLASSIFIED

REQUIREMENT

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CIA/IAD PROJECT

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